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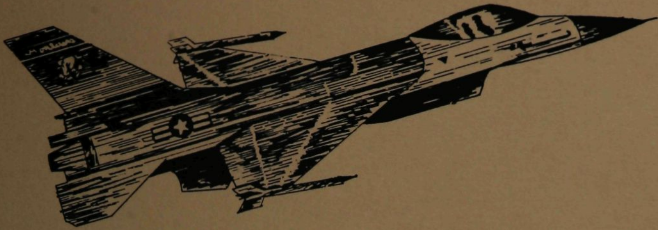

ENVIRONMENTAL ASSESSMENT
OF AN AIRCRAFT CONVERSION

MONTANA AIR NATIONAL GUARD
GREAT FALLS, MONTANA

AUGUST 1986

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by

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R. Pearl, L. Trevorrow, and J. Hoffecker

Energy and Environmental Systems Division
Environmental and Resource Assessment Group

August 1986

work sponsored by

AIR NATIONAL GUARD SUPPORT CENTER
Environmental Protection Branch
Andrews Air Force Base, Maryland

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LIST OF ABBREVIATIONS

ACEE = Aircraft Engine Emissions Estimator

AGE = aerospace ground equipment

ANG = Air National Guard

CEQ = Council on Environmental Quality

CFR = Code of Federal Regulations

CO = carbon monoxide

dB = sound level in decibels

DLA = Defense Logistics Agency

FIG = Fighter Interceptor Group

HC = hydrocarbons

hr = hour

L_{dn} = 24-hour average sound level

MOA = military operating area

NEPA = National Environmental Policy Act

NO_x = nitrogen oxides

O_x = photochemical oxidants

SEL = sound exposure level

SO_2 = sulfur dioxide

TSP = total suspended particulates

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SUMMARY

It is proposed that the 120th Fighter Interceptor Group of the Montana Air National Guard convert from 18 F-106 to 18 F-16 aircraft. Associated with this conversion are building modifications, land acquisition, and facility construction. The environmental assessment determined that the primary impacts of the conversion would be positive. Noise modeling using the NOISEMAP methodology showed that the maximum noise reduction, resulting from the conversion, at any ground receptor point is about 5 dB on the L_{dn} scale. The noise reductions vary with the distance of a receptor point from the runways -- the greater the distance, the smaller the noise reduction. Conversion to the F-16 prior to completion of a "hush house" would result in a temporary increase in noise to the southeast of the airport over a commercial and industrial area. In addition, total air pollutant emissions from aircraft operations would be reduced as a consequence of the conversion.

No significant adverse impacts are predicted as a result of the conversion from F-106s to F-16s.

1 INTRODUCTION

1.1 SCOPE AND PURPOSE OF THE PROPOSED ACTION

The U.S. Air Force continues to modernize Air National Guard (ANG) units by replacing existing aircraft with newer models. This replacement program is referred to as an aircraft conversion. The current document provides an environmental assessment of one such conversion, proposed for the 120th Fighter Interceptor Group of the Montana Air National Guard, based at the Great Falls International Airport.

The tactical fighter mission is vital to the national defense and must be continued. This priority has been established at all levels of U.S. Department of Defense decision making. It has been specifically accepted by the National Command Authority through inclusion in annual presidential budget submissions, and it has been confirmed by the Congress.

In accordance with the "Total Force Policy," it is a national defense objective to shift to the Air National Guard increasing responsibility for maintaining the nation's air combat capability. As part of a general upgrading of ANG combat capability and modernization of the ANG aircraft inventory, the tactical fighter mission is being enhanced.

All ANG units, including the 120th Fighter Interceptor Group (FIG), are charged with maintaining combat readiness and sufficient mobility to deploy globally in the event of a federal activation. The proposed action addressed here is to replace the 18 F-106 aircraft currently assigned to the 120th Fighter Interceptor Group with 18 F-16 aircraft. The specific purpose of this proposed conversion is therefore to modernize the equipment of the Montana ANG and to upgrade the contribution of the 120th FIG to the national defense posture.

1.2 SUMMARY OF ENVIRONMENTAL-STUDY REQUIREMENTS

Under the National Environmental Policy Act of 1969 (NEPA), federal agencies are required to take into consideration the environmental consequences of proposed actions in the decision-making process. The intent of NEPA is to protect, restore, or enhance the environment through well informed federal decisions. The Council on Environmental Quality (CEQ) was established under NEPA to implement and oversee federal policy in this process. To this end CEQ has issued "Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act" (40 CFR, 1500-1508, 1978). The CEQ regulations (1978, page 28) specify that an Environmental Assessment be prepared which serves to:

1. Briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact.

2. Aid an agency's compliance with the Act (NEPA) when no environmental impact statement is necessary.

3. Facilitate preparation of a statement when one is necessary.

To comply with NEPA and ensure minimal impact on the environment, the planning process for this aircraft conversion includes this study of environmental issues related to the proposed conversion and specifically addresses construction of new facilities, modifications of existing buildings, and acquisition of additional land. The purpose of the current document is to satisfy the first two CEQ requirements outlined above.

2 THE TWO ALTERNATIVES

2.1 CONVERSION ALTERNATIVE

2.1.1 Introduction

The Air National Guard is proposing to convert from the F-106 to the F-16 aircraft at the 120th Fighter Interceptor Group, based at the Great Falls International Airport, Montana. The ANG is presently planning additional safety easements, miscellaneous building alterations, and construction of facilities to support this aircraft conversion.

2.1.2 Characteristics of Aircraft Involved

The F-16 is a compact, multirole fighter aircraft designed for air-to-air combat and air-to-surface attack. Manufactured by the General Dynamics Corporation, the F-16 can both engage enemy aircraft in aerial combat and begin air-to-surface attacks, thereby providing the battle commander with an airplane that can be used in changing combat situations. One Pratt and Whitney F-100-PW-100 turbofan engine, with an afterburner, powers the F-16 and generates 25,000 pounds of thrust, giving the aircraft a combat ceiling of more than 50,000 feet and a ferry range of more than 2,000 miles. Maximum takeoff weight is 35,400 pounds. The F-16 can take off without reliance on the afterburner.

2.1.3 Aircraft Operations

The F-16 is expected to fly the same number of sorties per day as the F-106 aircraft, with the exception of initial increased flight activity as the pilots make the transition to the new planes. The F-16 aircraft will perform practice low approaches and touch-and-go landings. Traffic patterns would be consistent with established local procedures at the Great Falls International Airport. Normal operations will be conducted Tuesday through Saturday between 0700 and 2200 hours. While Monday is usually a nonflying day, occasional Monday sorties may be flown. During the monthly Unit Training Assembly weekend, flying operations will also be conducted on Sunday from 1200 to 2200 hours.

Currently the F-106s fly 200 sorties per month for an average of 2 hr each. This equates to 4800 hr/yr of flying time (Shick, 1986). With the conversion to F-16s, the flying time is expected to remain the same. There is, however, a differential accident rate for F-106s and F-16s. The F-106 accident rate for fiscal year (FY) 1985 was 3.6 per 100,000 flying hours, and in FY86 there are no accidents thus far. The F-16 has a higher accident rate: 4.6/100,000 flying hours in FY85 and 6.2/100,000 flying hours in FY86. Application of such rates to the small number of hours flown each year by the Montana ANG makes consideration of accidents for this environmental assessment of no consequence.

2.1.4 Personnel Summary

Converting the F-106s to F-16s at Great Falls would mean a slight decrease in military and civilian staffing requirements. Table 2.1 below shows the comparative requirements of the two aircraft for full-time and part-time employment.

As can be noted, the manpower requirement resulting from the proposed conversion to F-16s would be less than that now existing. There would be an expected 17% reduction in full-time authorizations and a 1% increase in part-time authorizations.

Jobs would also be created by construction projects related to the conversion, as summarized in Sec. 2.1.5. Table 2.2 includes a summary of construction-related employment requirements, which would total 10-50 jobs over the next several years.

2.1.5 Construction Program

Several construction projects would be required to support conversion to F-16s at the Great Falls International Airport. Table 2.2 outlines the projects, costs, and schedule related to this program. As can be noted, the construction program includes a flight simulator, a missile maintenance/storage and alert facility, and a special fuels facility (for hydrazine). In addition to the above there would be alterations to various other facilities on site. The total construction cost for all of these improvements is estimated to be approximately $8 million. Construction is planned to begin in 1987, and the last project is expected to be completed in 1992.

2.2 NO-ACTION ALTERNATIVE

The F-106 aircraft was originally designed for an airframe life of 2,000 hours of flying time. Currently the typical F-106 at the Air National Guard, Great Falls, Montana, has 7,000 hours of flying time (Shick, 1986). Although the aircraft have been continually serviced and in some cases reskinned, their remaining useful life is limited; nor will spare parts be available for F-106 aircraft in the future. The no-action

TABLE 2.1 Staffing Requirements for the Two Alternatives

	Full-Time	Part-Time
F-106 (existing)	459	1039
F-16 (proposed)	381	1049
Staff Change	-78	+10
% Change	-17	+1

TABLE 2.2 Construction Projects Required by the F-16 Conversion, Montana ANG

Project Title	Associated Employment Requirement	Estimated[a] Material Cost ($)	Total Construction Cost ($)	Estimated Dates	
				Start	Finish
Flight Simulator	15	467,500	850,000	May '87	June '88[b]
Alterations of Other Facilities	30	514,250	935,000	Aug. '88	Aug. '89
Missile Maintenance Storage and Alert Facility	50	3,300,000	6,000,000	May '91	Oct. '92
Special Fuels Facility	15	89,100	162,000	April '87	Dec. '87
Total		4,370,850	7,947,000		

[a]Material costs are conservatively estimated at 55% of total construction costs.

[b]Flight simulator equipment contractor acceptance inspection: July 1988.

Source: Shick, 1986.

alternative would mean that the 18 F-106 aircraft currently located at the Great Falls International Airport would remain in place. Construction currently planned for the conversion would not take place. The personnel requirements for the base would remain unchanged.

2.3 ENVIRONMENTAL CONSEQUENCES

2.3.1 Proposed Conversion

The proposed action could result in a slight reduction of staff associated with aircraft operation and maintenance. Counteracting this reduction in staff would be a modest short-term increase in demand for construction workers to build the facilities required for the conversion. This construction employment should have a direct beneficial effect on the area's economy. The construction activity could also have secondary effects on the local economy if some of the approximately $4.4 million worth of materials are purchased locally.

In terms of air quality, aircraft emissions would be reduced with the conversion from the F-106 to the F-16. The annual emissions indicate a reduction in all of the pollutants of concern. There would be a short-term increase in the fugitive dust emissions because of construction-related activities.

Noise would be reduced as a consequence of converting to the F-16. A maximum reduction in noise at any ground receptor point of about 5 dB -- as measured on the L_{dn} (24-hr average sound level in decibels) scale -- would be the specific result. The noise reductions vary with the distance of a receptor point from the runways -- the greater the distance, the smaller the noise reduction. This noise reduction would constitute the primary environmental benefit resulting from the conversion. For a time after conversion, it is expected that noise to the southeast of the airport may increase as a result of unsuppressed engine runup. Completion of a "hush house" is scheduled for March 1989. Upon completion, this facility would lead to a reduction of noise in the southeast sector.

No significant impacts are anticipated in the following areas: water; wastes and stored fuel; archaeological/historical sites; land and soil quality; pesticides; socioeconomic factors; air and land traffic; natural resources; endangered and threatened species; and land use.

2.3.2 No-Action Alternative

The no-action alternative leads to no new perturbations in the local environment. Existing conditions of air quality and noise are worse under the no-action alternative than under the proposed conversion alternative.

3 AFFECTED ENVIRONMENT

3.1 PHYSICAL AND DEMOGRAPHIC SETTING

3.1.1 Montana Air National Guard, Great Falls International Airport

The Air National Guard has been located at the Great Falls International Airport since 1953 (Peat Marwick, 1985). The ANG facilities include over 50 buildings and occupy approximately 125 acres at the Great Falls International Airport. Full-time employment for the ANG is currently 459, and part-time employment is 1,039. Figure 3.1 shows the layout of the ANG facilities at Great Falls.

3.1.2 The City of Great Falls, Adjacent Towns, and the Surrounding Region

Great Falls is the dominant urban area in Cascade County; 70% of the county population is within this metropolitan area. The county contains a number of small towns, including Sun River, Vaughn, Portage, Sand Coulee, Stockett, Belt, Armington, Ulm, Cascade, Eden, Monarch, Fife, and Black Eagle. Figure 3.2 shows the location of the Great Falls International Airport in reference to the larger cities in the region.

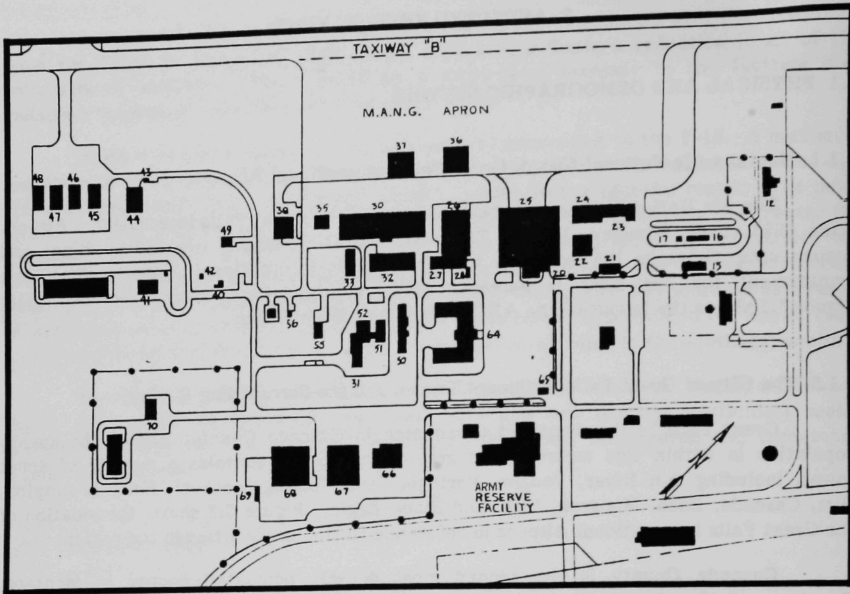
Cascade County is the second most densely populated county in Montana. County population density is approximately 30 people per square mile, while the state as a whole has a population density of 5.4 people per square mile. The Missouri and Sun Rivers converge in Great Falls, providing adequate water for the area. The predominant land use in the county is agriculture, with 80% of all land in farms or ranches (U.S. Bureau of the Census, 1983a).

3.2 ENVIRONMENTAL SETTING

3.2.1 Air Quality

The airport is located on a plateau about 350 feet higher than most of the immediate valley area. Except to the north and northeast, the valley is encircled by mountain ranges which lie about 30 miles away from east to south, 40 miles to the southwest, and 60-100 miles distant from west to northwest. A characteristic of the climate in the area is the presence of frequent wintertime chinook winds. Although the average wind speed is relatively high (12.8 mph), strong winds over 70 mph are seldom observed. Visibility normally is excellent. Although the average annual precipitation at Great Falls would normally classify the area as semiarid, about 70% of the annual total occurs normally during the April to September growing season.

The city of Great Falls is located in Air Quality Control Region 141 in the State of Montana. There are four major sources of air pollution in the Great Falls area: open



MONTANA ANG FACILITIES MAP

12 Res Forces Opl Tng
15 POL Building
16 Covered Walkway
17 Pump Stn Liq Fuel
20 Elec Pwr Stn Bldg
21 AGE/Storage Facility
22 Shp AGE/Storage Facility
23 Acft Corrosion Control
24 Fire Station
25 Hangar, Maintenance
26 Operations/Comptroller
27 Security Police
28 Hazardous Storage Base
30 Armament Engine I & R
31 BCE Maintenance Shop
32 Composite Maintenance Fac
33 Warehouse, Supply & Equip Base
34 Warehouse, Supply & Equip Base
35 Shop, Acft Maintenance
36 Aircraft Shelter
37 Aircraft Shelter
38 Fuel Sys/Corrosion Control Dock
40 Security Entry Control Bldg
41 Shop, Weapons & Release/Sys
42 Hazardous Storage Base
43 Traffic Check House
44 Readiness Crew
45 Aircraft Shelter
46 Aircraft Shelter
47 Aircraft Shelter
48 Aircraft Shelter
49 Hydrazine Fac (Proposed)
50 Res Forces Opl Tng
51 BCE Maintenance Shop
52 BCE Maintenance Shop
56 Hangar, Maintenance
64 Res Forces Opl Tng
65 Traffic Check House
66 Vehicle Maintenance Shop
67 Vehicle Ops Parking Shed
68 Base Supply Whse & Admin
69 Hazardous Storage
70 Shop, Ammo Maintenance

FIGURE 3.1 Layout of Montana ANG Facilities at Great Falls International Airport (Source: Montana Air National Guard)

burning, agricultural sources, light industrial sources, and motor vehicle sources (see Table 3.1). The effect of wind erosion on exposed surfaces is also a natural cause of emission of particulate matter. Aircraft operations do not significantly contribute to the levels of air pollution present in Great Falls (Tables 3.1 and 3.2). The area has been designated an attainment area (an area below the ambient air quality levels mandated by law) for hydrocarbons (HC), sulfur dioxide (SO_2), nitrogen oxides (NO_x), and photochemical oxidants (O_x). A section of downtown Great Falls has been designated as nonattainment for carbon monoxide (CO) and for the secondary standard for total suspended particulates (TSP).

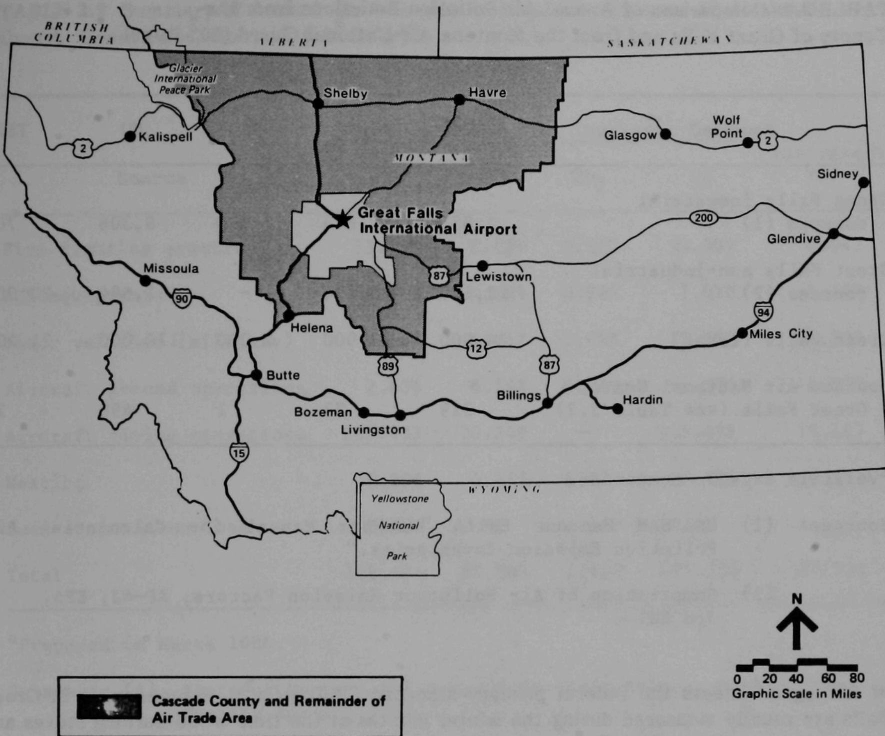


FIGURE 3.2 Location of Great Falls International Airport in Relation to the State of Montana (Source: Peat Marwick, 1985)

The federal government regulates pollutants by applying national ambient air quality standards (NAAQS). In addition, the State of Montana has legislated air quality standards that are more strict than NAAQS for TSP and CO.

Monitors closest to the Air Base are in the city of Great Falls. Only TSP and CO are measured in Great Falls; there are monitoring stations located both east and west of the airport. For 1985, the measured annual average for TSP was 79 $\mu g/m^3$ (arithmetic average) at the fire station and 53 $\mu g/m^3$ (arithmetic average) in downtown Great Falls. The 79 value exceeds the State limit of 75 $\mu g/m^3$ (arithmetic mean); the annual federal limit is 75 $\mu g/m^3$ (geometric mean). This 79 micrograms (arithmetic average) is less than the federal limit, 75 $\mu g/m^3$, since the arithmetic mean (due to a few high values) is generally about 10% greater than the geometric mean. The "highest second highest" 24-hr TSP measurement in Great Falls during 1985 was 225 $\mu g/m^3$. This value exceeds the State primary standard (200 $\mu g/m^3$); the State has no secondary standard. The value

TABLE 3.1 Comparison of Annual Air Pollution Emissions from the County of Great Falls and from the Montana Air National Guard (10^3 lb/yr)

Source	VOC[a]	NO_x	SO_2	CO	TSP
Great Falls industrial sources (1)	1,850	876	2,000	8,306	700
Great Falls non-industrial sources (2)	22,150	22,124	-	161,694	20,300
Great Falls (total)	24,000	23,000	2,000	170,000	21,000
Montana Air National Guard, Great Falls (see Table 3.2)	319	83	1	496	27

[a]Volatile organic compounds.

Sources: (1) USAFSAM Handout EH114 "Methods Manual for Calculating Air Pollution Emission Inventories."

(2) Compilation of Air Pollutant Emission Factors, AP-42, EPA, 3rd Ed.

of 200 $\mu g/m^3$ meets the federal primary standard (260 $\mu g/m^3$). Exceedances in Great Falls are usually measured during the winter months at the time wood-burning stoves are commonly used. In spite of these exceedances, it should be noted that the monitoring stations are always placed in locations where TSP problems are expected, for example in areas of road dust and wood-burning stoves. No samplers have been placed at the Air Base; however, it is expected that the air quality is better than at these city locations.

A nonattainment area for CO exists from 10th Avenue south to 48th Street in a corridor where city traffic is present. This area is about one mile from the ANG Base. This designation was based on 1984 data. No exceedances, however, existed for 1985. Nitrogen oxide measurements have been made at a monitor 10 miles east of Great Falls at the site of a power plant. Very low concentrations were measured. It is expected that concentrations of other criteria pollutants are very small in the Great Falls area; no monitors are present to verify that expectation, however.

Presented in Table 3.2 is the air emissions inventory due to activities of the Montana Air National Guard. As may be seen, the emissions of particulates, NO_x, and SO_2 are quite small. In addition, flying operations contribute most to each pollutant inventory.

TABLE 3.2 Summary of Annual Air Pollution Emissions at Montana Air National Guard, Great Falls, Montana (10^3 lb/yr)[a]

Source	Organic Gas: HC	Organic Gas: NO_x	Inorganic Gas: SO_2	Inorganic Gas: CO	Particles: TSP
Fire fighting practice	33.741	0.225	0.022	30.391	6.947
AGE equipment	5.965	0.265	0.066	7.070	0.707
Motor vehicles (military)	1.687	1.667	0.068	15.683	0.223
Aircraft ground operations	2.634	6.142	0.919	6.574	0.879
Aircraft flying operations	265.437	70.249	--	435.472	18.187
Heating	0.294	4.417	0.022	0.736	0.368
Fuel evaporation loss	9.866	--	--	—	—
Total	319.624	82.965	1.097	495.926	27.311

[a]Prepared in March 1986.

Sources: (1) State of Montana Emissions Inventory, Helena, Montana Air Quality Bureau, 1985.

(2) Montana State Implementation Plan, Montana Department of Health and Environmental Sciences, 1975.

3.2.2 Noise

General. On a national basis, noise from jet aircraft operations has been a concern for many years. The acoustic energy generated by aircraft can be irritating to people in the general vicinity of airports. Existing noise sources at the Great Falls International Airport include military operations, commercial operations, and general aviation activities.

Noise Environment. To provide a baseline that represents existing conditions, noise contours were prepared using the Air Force NOISEMAP methodology. The resulting noise exposure estimate is expressed using the day/night average sound level (L_{dn}) noise contours. This methodology considers the effect of an aircraft single event (source noise, altitudes, and air speeds), how many times the events occur during a 24-hr period, and the time of day that they occur. L_{dn} is the 24-hr average sound level, in decibels, for the period from midnight to midnight, obtained after addition of 10 dB to sound levels occurring during the night (from midnight to 7 a.m. and from 10 p.m. to midnight). The NOISEMAP methodology uses the following flight data:

- Aircraft type
- Altitude profiles
- Thrust/power schedules
- Flight track locations
- Number of operations per track
- Runway utilization schedule
- Arrival and departure schedule
- Runup (ground testing) data.

The noise contours for the current level of airfield activity (civil and military) are shown in Fig. 3.3. These contours resulted from a run of the NOISEMAP model and define the areas of noise levels around the airfield -- L_{dn} = 65, 70, 75, 80, and 85. The values on the noise contours can be interpreted to represent different levels of human reaction and are often used as guidelines for zoning for local communities in the vicinity of Air Force bases. The NOISEMAP methodology does not account for the altitude difference between the airport and Great Falls (approximately 350 ft). Because of this, NOISEMAP results are conservative. The NOISEMAP calculations were based on the runway utilization breakdown presented in Table 3.3. There were 12 sorties per day, with one touch-and-go or low approach per sortie. The Federal Interagency Committee on Urban Noise, which includes the Air Force and the Department of Housing and Urban Development, considers L_{dn} levels below 65 dB compatible with residential land use. Residential land use is discouraged for areas with noise levels between 65 and 70 dB on the L_{dn} scale; strongly discouraged for areas between 70 and 75 dB, L_{dn}; and unacceptable for areas that exceed 75 dB on the L_{dn} scale.

From the contours in Fig. 3.1, it is clear that part of the city of Great Falls lies within the 65-dB contour. No residences lie within the 75-dB contour, although some are present in the 65-70 dB contour. Most of the noise influence is considered to result from F-106 approaches to Runway 21.

Noise-Complaint History. The airport manager is responsible for answering all written and verbal complaints about noise directed against civil aircraft operations. Complaints concerning military operations are passed on to the Director of Operations. No such complaints were received during 1985 about military flights. However, the quantity of complaints is not necessarily indicative of the level of annoyance. The NOISEMAP contours provide an indicator of potential community annoyance to the aircraft noise.

FIGURE 3.3 Noise Isopleths from the NOISEMAP Model, Current Situation, F-106

TABLE 3.3 Runway Utilization for the Great Falls Airport (Military and Civilian Aircraft)

Runway No.	Air Carrier Arrivals (%)	Air Carrier Departures (%)	Commuter and General Aviation Arrivals (%)	Commuter and General Aviation Departures (%)	Military Arrivals (%)	Military Departures (%)
03	8	8	7	7	20	20
21	90	90	80	80	80	80
16	1	1	1	1	-	-
34	1	1	1	1	-	-
07	-	-	1	1	-	-
25	-	-	10	10	-	-
All	100	100	100	100	100	100

Noise-Abatement Procedures. The Montana ANG currently follows several noise abatement procedures at the airport. The F-106 is powered by an engine equipped with a turbine afterburner. The afterburner is used for relatively short periods to generate additional engine thrust. Standard military takeoff procedures for the F-106 require the use of the afterburner from the time the aircraft begins its takeoff roll until the time it achieves an airspeed of 300 knots, in a specific takeoff-climb configuration. The actual point of afterburner deactivation usually occurs at about one-half mile from the departure end of a runway, at an altitude of 300-500 ft above airport elevation.

The ANG has established noise-abatement departure procedures intended to minimize noise generation at the airport. F-106 aircraft departing to the northeast from Runways 03 and 21 deactivate their afterburners at an airspeed of 275 knots instead of at 300 knots. The actual point of afterburner deactivation usually occurs over the southwest departure end of the runway, before the aircraft has cleared the bluff of the Sun River Bench. The departure aircraft continue their climb at a relatively steep angle, maintaining 275 knots. At an altitude of 6500 ft above mean sea level, the pilot undertakes the next portion of his training exercise. With the limited use of the afterburner and the steepened angle of departure climb, noise effects on the developed areas around the Airport are reduced.

As one of their flight patterns, the ANG aircraft perform the standard military recovery "360 overhead" approach. Jet takeoff is from the Air National Guard Base; then, on return from the training mission, this circular flight pattern is flown over the less densely developed areas west of Malmstrom Air Force Base. The jets do not land at Malmstrom, however; on completion of their 360 overhead pattern, they return to the ANG Base. Supersonic flights are conducted only in designated training areas over land or water.

3.2.3 Water

The Great Falls, Montana, Air National Guard Base obtains its potable water from the City of Great Falls. As determined, the sodium bicarbonate water is of good quality and is moderately hard (D. Ingman, 1985; see also Table 3.4).

At the present time, the Great Falls water treatment plant, which is designed to treat 48 million gallons per day (mgpd) of Missouri River water, is treating about 11 mgpd. The city has the legal right to divert 125 mgpd from the Missouri River, but the maximum it diverts at any one time is 14 mgpd.

During the period July 1984 through April 1986, annual base water usage normally varied from a maximum in August to a minimum in November. According to base records, during this period water usage ranged from a high of 2,516,272 gal/mo to a low of 993,344 gal/mo and averaged 1,381,930 gal/mo.

TABLE 3.4 Dissolved Constituents in the Drinking Water of Great Falls

Constituents	Concentration[a]
Arsenic	0.005
Barium	0.05
Bicarbonate	151.3
Cadmium	<0.005
Calcium	43.1
Chromium	<0.005
Fluoride	0.90
Iron	<0.01
Lead	<0.005
Magnesium	13.3
Manganese	<0.005
Mercury	<0.0002
Nitrate (as N)	<0.01
Selenium	<0.002
Silver	<0.01
Sodium	16.5
Sulfate	49.0
Conductivity (lab)	392 μmhos
Hardness	162 (calcium carbonate)
Type	Sodium bicarbonate

[a]Unless otherwise noted, all concentrations are mg/L.

Source: Montana Dept. of Health and Environmental Sciences.

Surface Water Hydrology. The Montana Air National Guard Base is located on the Sun River Bench (locally known as Gore Hill), approximately 350 ft above the Missouri and Sun Rivers. The base is outside the 100-yr floodplain and not subject to flooding by these rivers (Peat Marwick, 1985).

Storm runoff on the base and adjacent Great Falls International Airport is collected through a network of swales, ditches, culverts, and storm sewers and is diverted over the south or north edges of the Sun River Bench and into the Missouri and Sun Rivers.

Groundwater Hydrology. A 300-ft-deep water well is located at building 34. Water from this well is used for cooling, noise suppression, and emergency purposes only. Analytical laboratory tests conducted in March 1986 did not detect the presence of any coliforms in the water from this well (V. Richtscheid, 1986).

3.2.4 Wastes and Stored Fuel

Sanitary Sewage. Sanitary sewage generated on the base flows in collector pipes to the Great Falls International Airport pumping facility where it is pumped to the City's sewage treatment plant near the Missouri River for treatment and disposal. The Great Falls sewage-treatment facility is a full-scale secondary treatment plant which normally operates at about 25% of capacity (Peat Marwick, 1985).

Nonhazardous Waste. The Great Falls ANG base annually generates 144 tons of nonhazardous solid waste. This material is disposed of in the City of Great Falls 100-acre landfill north of Black Eagle. Small volumes of such items as paints and paint-strippers are collected by a private contractor for disposal.

Jet engines are tested in a Shaw-Estes noise-suppression structure. Testing procedures generate small quantities of waste jet fuel, oil, and water. This mixture goes to a separator, in which the water is separated from the other liquids. Water is then disposed of in the sanitary sewer, and the jet fuel and oil are stored and disposed of by burning as a secondary fuel source for the base boilers. Excess waste fuel and oil are used in the fire pit for training purposes.

Hazardous Waste. The ANG has developed and implemented management plans for the handling and disposal of hazardous waste. In addition it has prepared an oil and hazardous substances pollution contingency plan (Montana Air National Guard, 1985). Hazardous materials are handled at the base in accordance with Montana State regulations; U.S. Environmental Protection Agency regulations, expressed in 40 CFR; and Air National Guard regulations 19-1, 19-7, 19-11, and 19-14.

A number of hazardous wastes are routinely transferred from the Montana Air National Guard base to the Defense Logistics Agency (DLA); these include fuels, fuel oils, lubricating oils, and cleaning solvents. Recent monthly volumes of these wastes have been about 150 gal.

The wastes are collected and stored at a designated, isolated area on the base. Storage of any waste at this area, pending pickup by the DLA, is limited to 90 days.

Stored Fuel. Fuel storage tanks located at the Montana Air National Guard Base include the following: seven 25,000-gal underground storage tanks for JP-4 jet fuel; two 4,000-gal underground storage tanks for motor vehicle gasoline. Diesel fuel is stored in four tanks: one 3,000-gal underground storage tank, one 5,000-gal underground storage tank, and two 500-gal above-ground storage tanks.

Present flight practices use approximately 400,000 gal/mo of jet fuel. The Montana Air National Guard plans to construct two additional 25,000-gal JP-4 fuel storage tanks in the 1990s. When constructed, these tanks will meet all applicable state and federal storage tank requirements. The installation of new fuel storage tanks is necessary to meet a new requirement for ANG bases, that each has storage capacity for 200,000 gal of jet fuel. (Neither of the new fuel storage tanks is required because of the proposed action.)

3.2.5 Archeological/Historical Resources

No archeological sites or historic structures are currently listed in the state files or on the National Register of Historic Places for the ANG base. No current archeological survey for the airport property exists.

3.2.6 Land and Soil Quality

The Montana Air National Guard occupies 125 acres of leased land on the 1,762-acre Great Falls International Airport. The facilities are located along the northeastern edge of the Sun River Bench (known as Gore Hill) at an average elevation of 3,674 ft or an average of 350 ft above the city of Great Falls. The land area occupied by the ANG primarily consists of built structures, aircraft apron areas, roads, and parking areas. Managed vegetation (primarily mowed grassland) is located on the southwestern one-third of the base. The soils of Great Falls International Airport consist of soft sandstone overlain by sandy silt and clay. With a natural, well managed vegetation cove, soil erosion is minimal.

Vegetation on and in the immediate vicinity of the airport consists of managed grasslands and dryland agriculture. Crops include dryland wheat and barley, with small amounts of pasture and harvested alfalfa. None of this land is classified as prime or unique farmland (Peat Marwick, 1985). There are no known wetlands or wetland vegetation on airport lands.

3.2.7 Herbicides and Pesticides

Small qualities of herbicides and pesticides have been routinely applied on the Montana Air National Guard Base for a number of years.

Herbicides have been routinely applied to control vegetative growth at the edge of runways. Natural processes around the base have limited the rodent and insect populations, thus limiting the use of pesticides to an as-needed basis. Because the Montana Air National Guard does not have certified pesticide applicators, all required pesticide applications are currently made by the Cascade County staff.

3.2.8 Socioeconomic Factors

The area of influence in terms of socioeconomics is Cascade County and the city of Great Falls. Cascade County is surrounded by Teton, Chouteau, Judith Basin, Meagler and Lewis and Clark Counties. Table 3.5 shows the population size and change for each of these counties. As can be noted, Cascade is the most populated of the counties, but lost population from 1970 to 1980 and from 1980 to 1985. Cascade County has 82% of the population living in urban areas. Great Falls, the county seat, has the majority of the county population with 56,725 people (U.S. Bureau of the Census, 1983b).

The Cascade County economy is based on two basic employment sectors. These are government employment (including the Air National Guard) and agriculture. Much of the remainder of the economy provides services. In this regard, Great Falls is a service

TABLE 3.5 Population and Population Change in Cascade and Surrounding Counties

County	1980[a]	% Change from 1970	1985[b]
Cascade	80,696	-1.4	80,300
Chouteau	6,092	-5.9	6,100
Judith Basin	2,646	-0.8	2,700
Lewis and Clark	43,039	29.3	46,100
Meagher	2,154	0.9	2,200
Teton	6,491	6.1	6,500

[a]Source: U.S. Bureau of the Census, 1983a, City and County Data Book, 10th Ed.

[b]Source: U.S. Bureau of the Census, 1985 -- computer-generated list of population estimates, July 1.

center for the area. In 1981, government and government enterprises accounted for approximately 28% of the earnings in the county with services accounting for 20% of the personal income (U.S. Bureau of the Census, 1983a).

In terms of employment, Cascade County had total employment of 37,682 in 1982 (Bureau of Economic Analysis, 1984). Table 3.6 shows employment by broad industrial source from 1978 to 1982. As can be noted total employment has been declining annually during this period. Government employment is the single largest employment sector accounting for 26 percent of total county employment in 1982 (government employment accounts for approximately 20 percent of the total state employment in Montana). Decline in government employment has been the primary contributor to the gradual decline in total employment.

The planning department indicated the county and city is dependent upon Air Force activities in the area and that cutbacks on Malmstrom Air Force Base contributed to the decline in employment and population from 1970 to 1980 (Mooney and Walters, 1986). Decline in other areas of the local economy has increased the economic dependence on the Air Force. Anaconda and Burlington Northern both left the area, and a local brewery has laid off workers. In addition, agriculture has been hard hit in recent years by drought and high costs (Mooney and Walters, 1986).

Although the figures presented in Table 3.6 represent federal, state and local government employment, the contribution of federal employment to the total represents approximately two-thirds of the total government employment. The Air Force base and the Air National Guard base are key economic assets to the county and the city of Great Falls. Government employment is considered basic employment which has beneficial secondary effects in other sectors of the economy. Thus, government jobs indirectly provide employment in such areas as services, finance, insurance and real estate.

3.2.9 Air and Land Traffic

Great Falls International Airport is classified as a small air traffic hub by the Federal Aviation Agency, with annual emplaned passenger traffic of 130,090 (Peat Marwick, 1985). There are currently 19 daily scheduled departures of commercial air carriers from the airport, which is a base of operations for about 85 civilian aircraft. Peat Marwick (1985) listed the number of military flights at 9,505 in FY 1983.

The primary access road to the airport is a diamond interchange off Interstate 15. Land traffic is currently not congested, and there is no need for traffic lights on any of the airport access roads.

3.2.10 Natural Resources

The present environment of Great Falls International Airport (including the Montana ANG) has been affected by past and ongoing construction and maintenance activities related to operation of the airport. Most vegetation on the base and the airport is mowed or managed for agricultural purposes, with isolated small patches of

TABLE 3.6 Employment by Broad Industrial Source for Cascade County

Industrial Source	1978	% of Total	1979	% of Total	1980	% of Total	1981	% of Total	1982	% of Total
Proprietors	3,745	9.1	3,864	9.4	3,907	9.9	3,963	10.2	4,051	10.8
Farm	391	1.0	461	1.1	438	1.1	437	1.1	434	1.2
Agricultural Services, Forestry, Fishing	94	0.2	90	0.2	86	0.2	a	-	105	0.3
Mining	<10	-	10	-	<10	-	a	-	29	0.1
Construction	2,263	5.5	2,092	5.1	1,638	4.1	1,358	3.5	1,278	3.4
Manufacturing	1,803	4.4	1,752	4.3	1,586	4.0	1,349	3.5	1,220	3.2
Transport and Utilities	1,954	4.7	2,073	5.1	1,923	4.9	1,962	5.1	1,800	4.8
Wholesale Trade	2,857	6.9	2,974	7.3	2,996	7.6	3,022	7.8	2,804	7.4
Retail Trade	7,163	17.4	6,956	17.0	6,585	16.6	6,536	16.9	6,358	16.9
Finance, Insurance, Real Estate	2,195	5.3	2,318	5.7	2,324	5.9	2,293	5.9	2,372	6.3
Services	7,389	17.9	7,297	17.8	7,609	19.2	7,490	19.3	7,360	19.5
Government	11,402	27.6	11,049	27.0	10,563	26.6	10,269	26.5	9,870	26.2
Total	41,263		40,936		39,664		38,793		37,682	

[a] Not shown to avoid disclosure of confidential information.

Source: Bureau of Economic Analysis, 1984.

natural habitat available for wildlife. While the Great Falls area lies within the Pacific and Central flyways, the migratory waterfowl primarily depend on the Missouri and Sun River River Basins for habitat. Thus, except for minor rest and feeding areas, the airport location is not an important component of the flyway.

3.2.11 Endangered and Threatened Species

Endangered animal populations that occur or have been noted in Cascade County include the Rocky Mountain wolf, black-footed ferret, peregrine falcon, and bald eagle. Only the bald eagle and peregrine falcon have been noted in the vicinity of the airport (Burns and McDonnell, 1979; U.S. Army Engineer District 1979). While the immediate airport area is urbanized and does not support breeding populations of these animals, the current airport and ANG activities do not make it impossible for bald eagles and peregrine falcons to use airport lands.

3.2.12 Land Use

Land use planning in Cascade County and Great Falls is carried out by the Great Falls City County Planning Board. The board has prepared the Great Falls Area Comprehensive Plan (1981) to guide development in the area. Table 3.7 shows the land use inventory by planning division in Great Falls. As can be noted from the table, division 6, which is adjacent to the Great Falls International Airport, has approximately 4,000 people living on 347 acres. This represents 49% of the total area of the planning division. The airport property is not included in the acreage reported above. The airport covers an additional 1,762 acres (Peat Marwick, 1985). Of the total airport acreage, the ANG accounts for 125 acres (Peat Marwick, 1985). Figure 3.4 shows the location of the planning divisions relative to Missouri and Sun Rivers.

Planning division 6 is composed of newly developing residential areas, an 18-hole private golf course, and vacant land. Residential development is occurring primarily to the east and southeast of runway 03-21. Some low-density residential units are located along the north side of the bluff, on which the airport is located. The elevation difference between residential areas and the airport is approximately 350 ft.

It is expected that future residential development will take place in division 6, requiring conversion of approximately 211 acres for single-family and multifamily units. The areas to the east and southeast of the airport (toward town) are primarily zoned R-1, suburban residential, and R-2, low-density residential. The areas away from town but surrounding the opposite end of the airport are largely agricultural. There is a general commercial district (B-2) zone southeast of the airport along Interstate 15. Figure 3.5 indicates land use in the Great Falls area.

3.2.13 Low-Level Flying Routes

The 120th Fighter Interceptor Group currently uses a number of low-altitude, high-speed training routes to perform its training mission with the F-106s. The Montana ANG uses the Hayes Military Operating Area (MOA) over north-central Montana, near

TABLE 3.7 Land Use Inventory Summary By Division (1978)

Division	Population	Single-Family Acres	Multi-family Acres	Commercial[a] Acres	Public and Semipublic Acres	Park and Recreation Acres	Industrial Acres	Total No. Acres
1	11,854	110	83	73	19	120	40	445
2	22,620	916	188	62	102	246	147	1,661
3	5,696	359	59	57	84	34	329	922
4	6,025	MALMSTROM AIR BASE						
5	8,549	682	60	130	131	241	191	1,435
6	3,797	280	67	25	158	68	103	701
7	7,341	810	66	66	34	260	218	1,454
8	7,374	547	31	85	148	141	755	1,707
9	821	923	--	5	--	4	913	1,845
Total	74,087	4,627	554	503	676	1,114	2,696	10,170

[a]These figures do not include private and commercial parking lots.

Source: Great Falls City County Planning Board 1981.

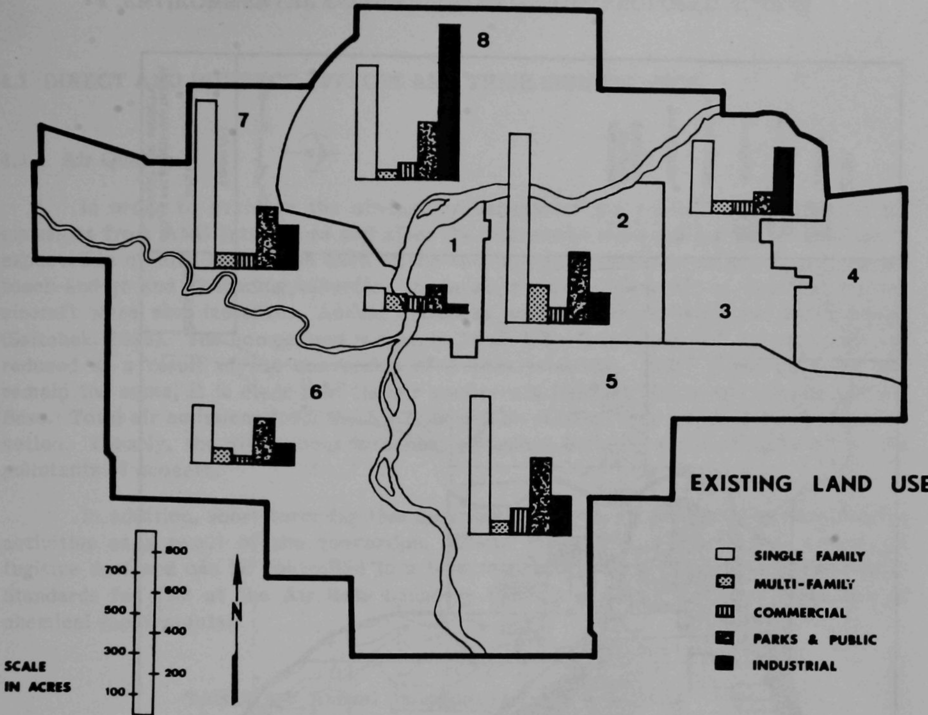


FIGURE 3.4 City of Great Falls Planning Divisions (Source: Great Falls City County Planning Board, 1981)

the Canadian border, for low-level training. Such routes and MOAs provide realistic training in high-speed, low-altitude navigation techniques and low-level intercepts. The F-106s fly at high altitude (15-30,000 ft above ground level) from their takeoff at Great Falls, then perform low-altitude exercises in prescribed training areas.

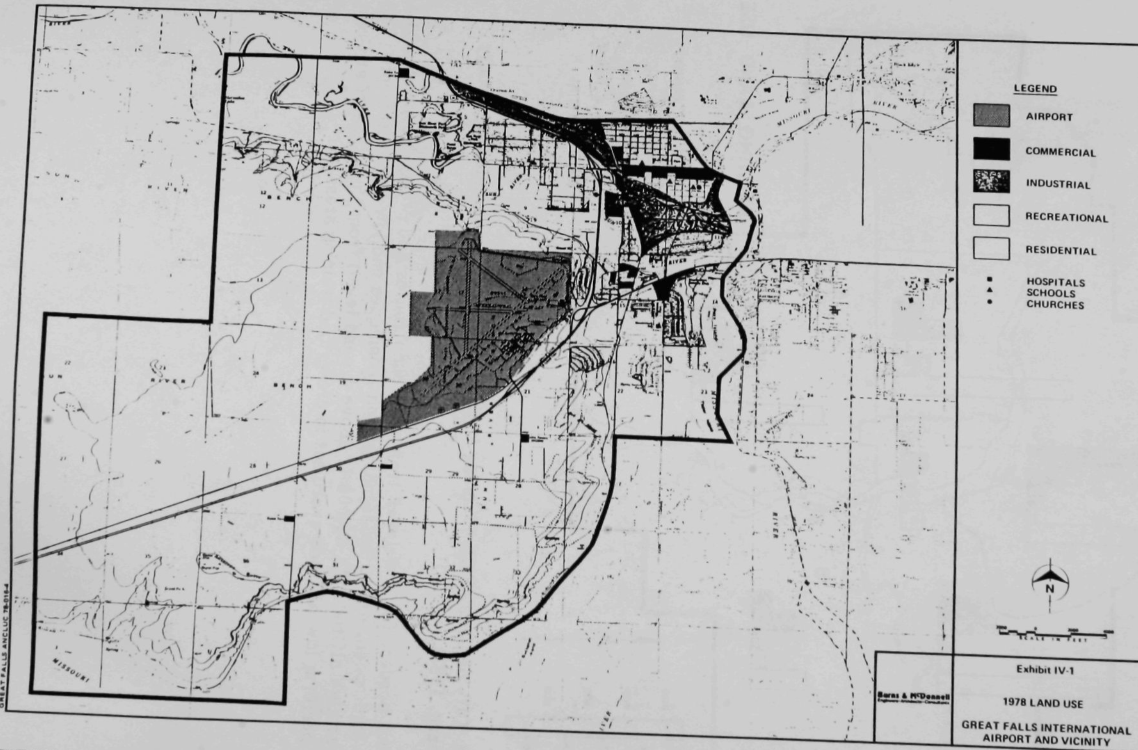


FIGURE 3.5 Land Use in the Great Falls Area

4 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION

4.1 DIRECT AND INDIRECT EFFECTS AND THEIR SIGNIFICANCE

4.1.1 Air Quality

In order to evaluate the air-quality impacts of the conversion of aircraft, air emissions from ANG jets before and after the conversion were estimated. No change is expected in civilian flights. In each of the two military cases considered, there were 12 touch-and-go and 12 landing-takeoffs. In the air-emission calculations, transient fighter aircraft were also included. Annual emissions were estimated using the ACEE Model (Seitchek, 1985). The comparison is seen in Table 4.1. It is found that air emissions are reduced as a result of the conversion of F-106s to F-16s. Since flight patterns will remain the same, it is clear that the air quality will improve within and outside the Air Base. Total air emissions from the Air Base will be reduced as a result of this conversion action. Clearly, the differences in annual emissions indicate a reduction in all of the pollutants of concern.

In addition, short-term fugitive dust emissions occur during various construction activities as a result of the conversion. These activities release a small amount of fugitive dust and can be controlled to a level that meets National Ambient Air Quality Standards for TSP at the Air Base boundary through periodic watering or the use of chemical suppressants.

TABLE 4.1 Annual Emissions from the Air Guard Aircraft (10^3 lb/yr)

Scenario	CO	HC	NO_x	TSP	SO_2
Present situation					
F-106	190	137	37	24	7
C-131	4	2	2	-	-
T-33	46	4	2	-	-
Transients	11	7	4	-	-
Total	251	150	45	24	7
After Conversion					
F-16	64	9	26	-	-
C-131	4	2	2	-	-
T-33	46	4	2	-	-
Transients	11	7	4	-	-
Total	125	22	34	-	-

4.1.2 Noise

Day/Night Average Sound Level

Noise contours were produced using the NOISEMAP methodology for two cases:

- Conversion to F-16 *without* the use of a "hush house." These predictions would be representative for about 21 months in the interim period of construction of the "hush house" (June 1987 - March 1989).
- Conversion to F-16 *with* a "hush house" in operation (after March 1989).

Noise isopleths for the two options are presented in Figs. 4.1 and 4.2. Isopleths for the existing condition (F-106 operation) are plotted as dashed lines. Predictions for F-16 operations with a hush house constitute the least noise impact. The F-106 operations (current operations, see Fig. 3.3) constitute the greatest noise impact. Clearly, the conversion from F-106 to F-16 aircraft reduces noise impacts. A major reason for the reduced size of the F-16 isopleths (Figs. 4.1 and 4.2 as compared to Fig. 3.3) is that the proposed aircraft does not use an afterburner for takeoff. The F-16, a more modern fighter than the F-106, is also more advanced in the technology of noise reduction. A comparison of Figs. 3.3 and 4.2 reveals that the use of F-16s leads to a 3-5 dB reduction in noise at any ground receptor point on the L_{dn} scale. It is interesting to note that the noise isopleths in Fig. 4.1 reveal a bulge to the southeast, not observed in Fig. 4.2. This expansion of the isopleths is clearly due to the presence of unsuppresed noise resulting from the absence of a hush house during ground run-up activities. Recall that Fig. 4.1 is applicable only during a 21-month transition period (estimated to be from June 1987 to March 1989).

Single-Event Analysis

A separate analysis was carried out to evaluate the impacts of individual flights on sensitive receptors in the vicinity of Great Falls. A survey of critical receptors within the 65-L_{dn} isopleths (Figs. 3.3, 4.1, and 4.2) revealed no churches, hospitals, or schools. As a result, two residential areas were chosen for study. The first (point A) is located at the tip of the 65-dB isopleth in Fig. 3.3; this point is positioned within the city of Great Falls and is at the extension of Runways 03 and 21. The second (point B) is also along the line of the two runways (03, 21) in the city of Great Falls, but is at the tip of the 70-dB isopleth. The single-event level for an instrument-flight-rules approach to Runway 03 was calculated for both an F-106 landing and an F-16 landing. Based on the operations data collected, these flights represent the greatest impacts on the community due to single flyovers. The flight paths are the same for both flyovers, although the power settings and flight speeds are different for the two aircraft.*

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*In this analysis, the maximum A-weighted noise level observed at a particular receptor during the noisiest flyover characterizes the short-term impact of an individual event.

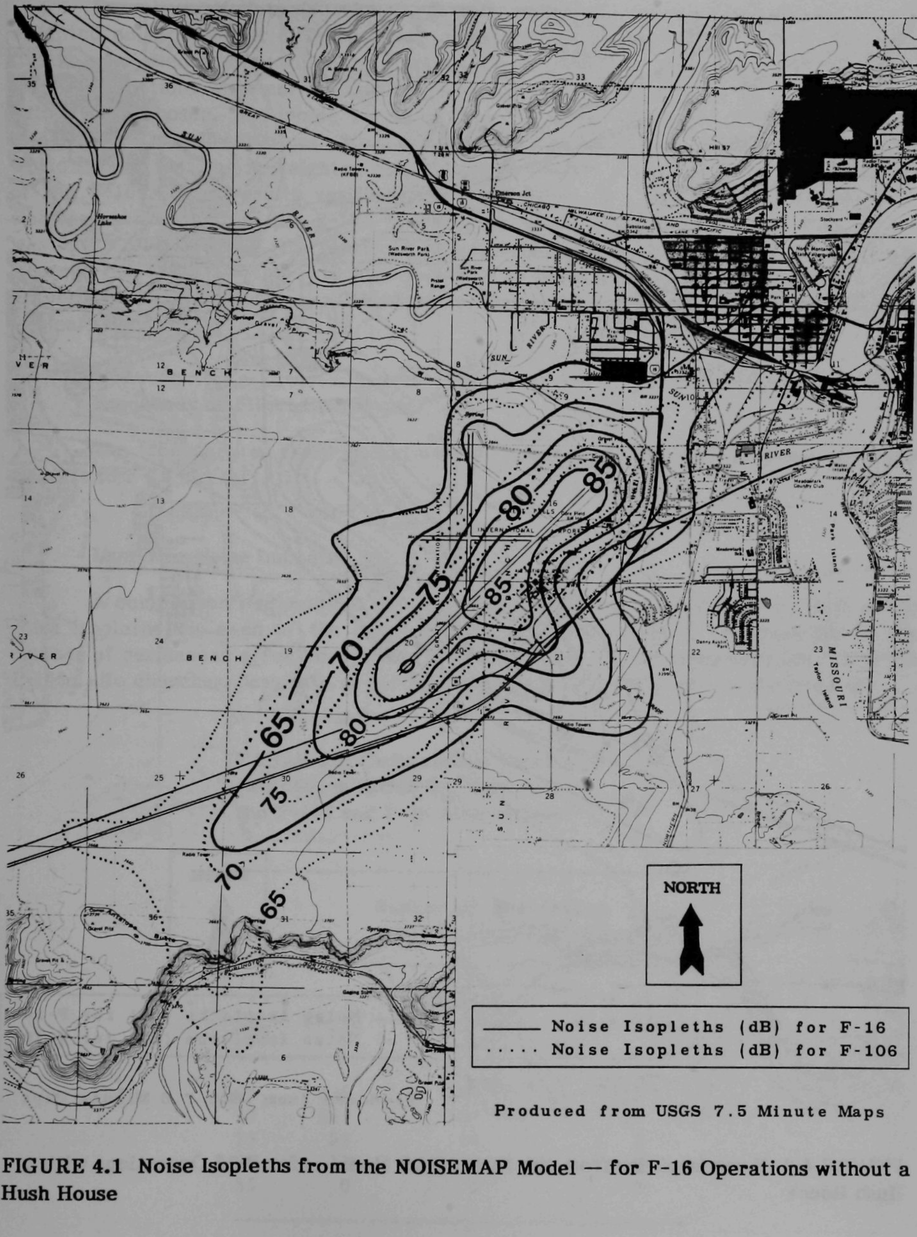

FIGURE 4.1 Noise Isopleths from the NOISEMAP Model — for F-16 Operations without a Hush House

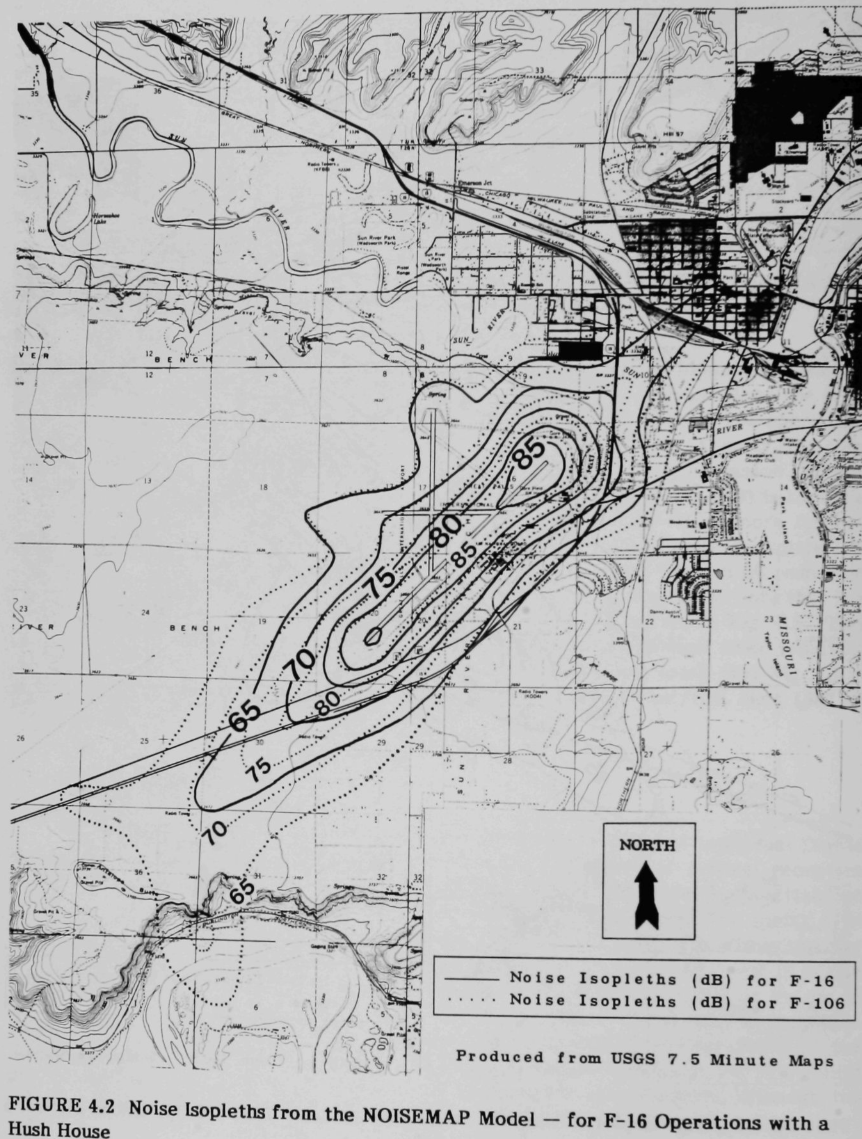

FIGURE 4.2 Noise Isopleths from the NOISEMAP Model — for F-16 Operations with a Hush House

Experimental data (Speakman, Powell, and Lee, 1978a and 1978b) on the A-weighted noise levels at different slant distances (air-to-ground) from F-16 and F-106 flights were used to determine the maximum value present at ground positions A and B. These calculations were carried out in the following way. Several points along the flight paths were chosen, and noise levels at the receptors were obtained by means of interpolating measured values. Since the F-16 is a less noisy aircraft than the F-106, one would expect that the A-weighted noise levels for the F-16 flyover are lower than those of the F-106. The results verified that expectation. For point A, the maximum A-weighted noise level for the F-106 was 94 dB, whereas the value for the F-16 approach was 89 dB. For Point B, the maximum A-weighted noise level for the F-106 was 92 dB, whereas the value for the F-16 approach was 88 dB. In summary, the impacts of the conversion of aircraft from F-106 to F-16 are less in terms of single-event noise levels at critical receptors.

Frequency of Flight Operations

The frequency of flight operations will not change with the conversion of F-106 aircraft to F-16 aircraft.

Land Use Noise Impacts

A comparison was made of the number of residences that exist within each of the noise isopleths for each of the cases analyzed. Table 4.2 shows the reduction in the number of residences affected by noise from the F-16s as compared with that from the F-106s. No churches, hospitals, or schools were identified within any of the isopleths.

TABLE 4.2 Comparative Number of Residences within L_{dn} Isopleths for the F-106 and F-16 Alternatives

	Number of Residences within L_{dn} Isopleth		
L_{dn}	F-106	F-16 without Hush House	F-16 with Hush House
65	636	348	320
70	187	103	94
75	87	14	7
80	10	6	3
85	0	0	0

Table 4.3 presents land use compatibility guidelines based on the noise exposure levels depicted in Figs. 3.3, 4.1, and 4.2. From the noise contours prepared, it is clear that the proposed F-16 mission would result in decreased noise levels in the local area. Noise contours generated for the F-16 are based on the same number of landing-takeoffs and touch-and-goes as for the F-106s. As a result, the contours shrunk in size in all directions in Fig. 4.2 as compared to the existing situation, in Fig. 3.3. The exception is the transition period shown in Fig. 4.1. A short-term increase in noise impacts to an industrial-commercial area occurs during a 21-month period. Most importantly, however, a significant decrease in impacts occurs between Fig. 4.2 as compared to Fig. 3.3 with respect to residential areas in Great Falls.

In terms of land usages, the F-16 conversion still indicates that some local residential areas remain within the 65-dB (L_{dn}) contour and above it (see Sec. 4.1.2). However, the number of residences within the 65-dB contour are fewer in number, as seen in Figs 4.1 and 4.2 and Table 4.2. As a result, the conversion helps reduce noise impacts in the residential areas near the airport. The results from Fig. 4.1 indicate that impacts for residential areas are reduced (as with Fig. 4.2); however, expanded isopleths to the southeast increase noise levels in the commercial-industrial area located in that direction as compared to current operations for the 21-month period before the hush house is completed.

4.1.3 Water

Conversion from the F-106 to the F-16 aircraft should cause no appreciable increase in domestic water usage on the Great Falls Air National Guard Base. If additional water is needed there should be no problem in acquiring it from the City of Great Falls which now supplies the base. The City of Great Falls presently does not divert all the Missouri River water it is legally entitled to. In addition the cities water treatment plant is operating at approximately 23% of capacity. The water treatment plant is expected to be adequate to meet demand through the year 2005 (Peat Marwick, 1985).

4.1.4 Wastes and Stored Fuel

Sanitary Sewage

Conversion to the F-16 aircraft should not cause any appreciable change in sanitary sewage. The Montana Air National Guard Base sanitary sewage is treated by the City of Great Falls at its sewage-treatment plant, which is presently operating at about 25% of capacity. This plant should be able to meet the needs of the Great Falls area for years to come.

The F-16 will not use the existing Shaw-Estes noise-suppression structure. The new "hush house" will use no water; thus, a reduction in water usage and waste water would result from a conversion to the F-16.

TABLE 4.3 Land Use Compatibility Guidelines[a]

	Day/Night Average Sound Levels (dB)				
Land Use Category	85	80-85	75-80	70-75	65-70
Residential	I	I	I	30[b]	25[b]
Industrial/Manufacturing	I	C[c]	C[d]	C[e]	C
Transportation, Communication, and Utilities	C	C	C	C	C
Commercial Retail Trade	I	I	30	35	C
Personal and Business Services	I	I	30	25	C
Public and Quasi Public Services	I	I	I	30	25
Outdoor Recreation	I	I	I	C[f,g]	C
Resources Production, Open Space	C	C[h]	C[h]	C	C

[a]Alphanumeric entries have the following meanings.

I - Incompatible: The land use and related structures are not compatible and should be prohibited.

C - Compatible: The land use and related structures are compatible without restriction and should be considered.

35, 30, or 25: The land use is generally compatible; however, a Noise Level Reduction of 35, 30 or 25 must be incorporated into the design and construction of the structure.

35^x, 30^x, or 25^x: The land use is generally compatible with NLR; however, such NLR does not necessarily solve noise difficulties and additional evaluation is warranted.

[b]Although it is recognized that local conditions may require residential uses in a compatible use district (CUD), this use is strongly discouraged in LDN 70-75 and discouraged in Ldn 65-70. The absence of viable alternative development options should be determined and an evaluation indicating that a demonstrated community need for residential use would not be met if development were prohibited in these CUDs should be conducted prior to approvals.

[c]An NLR of 35 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas or where the normal noise level is low.

[d]An NLR of 30 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas or where the normal noise level is low.

[e]An NLR of 25 must be incorporated into the design and construction of portions of these building where the public is received, office areas or where the normal noise level is low.

[f]Facilities must be low intensity.

[g]An NLR of 25 must be incorporated into buildings for this use.

[h]Residential structures not permitted.

Nonhazardous Waste

There should be no increase in amounts of nonhazardous waste generated resulting from conversion to the F-16 aircraft. The Montana Air National Guard's nonhazardous waste presently is being disposed of in the City of Great Falls landfill north of Black Eagle. It has been estimated that the capacity of this landfill is adequate to meet the needs of Great Falls for the next 20 or more years (Peat Marwick, 1985).

Hazardous Waste

With the exception of hydrazine, the types and volumes of hazardous waste generated and the procedures for handling and disposing of them would be about the same after the F-16 conversion as before. Thus, it is expected that adoption of the F-16 would have no significant effect on hazardous waste management at the Great Falls Air National Guard Base.

Stored Fuel

General. The Air National Guard plans to construct two additional 25,000-gal JP-4 fuel storage tanks in the 1990s. The addition of these two storage tanks is not related to the proposed action but to a requirement that the base have storage capacity for 200,000 gallons of fuel. It is anticipated that, after conversion and subsequent training, approximately 350,000 gal/mo of jet fuel will be used.

Hydrazine. Hydrazine, a hazardous material, is used on the F-16 aircraft as a source of emergency power for instruments and controls during temporary engine failure. The need for using this material stems from the necessity for a fuel that can provide a large amount of power from a small volume.

Although hydrazine is routinely employed in a variety of industrial applications, its use at the Montana Air National Guard Base is examined here because it is necessary to the deployment of the F-16. The potential impacts of hydrazine and the means of controlling them can be traced to the need for its use, its physical and chemical properties, its physiologic effects, and the operations involving it.

Hydrazine is a clear, oily liquid that evaporates a little more slowly than water at any given temperature. It is rated as a hazardous material because it is flammable and produces toxic effects in humans and lower organisms through ingestion, inhalation, or skin absorption. Two chemical properties of hydrazine are important to its use and handling at an air base. One is reaction on contact with a catalyst to yield large volumes of gases that can be used to provide hydraulic power or, on expansion through a turbine, electric power. This property is applied in the emergency power unit of the F-16. The other chemical property is reaction with hypochlorites, such as household bleach or HTH, to yield innocuous compounds: nitrogen, a salt, and water. This property is applied in neutralization of spilled hydrazine.

Hydrazine fuel would be delivered to the base as a 70% mixture (30% water) and stored in two 55-gal tanks. Because of the 70% concentration, the fuel is referred to as H-70. The H-70 is transported in 55-gal stainless steel drums, each in a styrofoam cask, by commercial carrier accompanied by a security escort. The maximum inventory on the base will be two 55-gallon drums of H-70.

Because it is consumed only during infrequent engine failure, the consumption rate of H-70 would be variable; the average rate may be about 150 gal/yr for 18 aircraft. The H-70 is carried by an F-16 in a tank with a 6.2-gal capacity that will be installed in or removed from the aircraft on the flight line. Tanks partially emptied by usage will be removed from the aircraft and transported to the hydrazine facility, a small, ventilated building with an area of about 800 ft^2. The operations carried out in the hydrazine facility will include storage of the H-70 inventory, filling and emptying of tanks, and collection of any drippings from those operations. Normally no waste H-70 will be generated; the remnants in any tank will be collected and recycled. Any fuel shown to be unusable by tests will be removed from the base by a Department of Defense (DOD) agency. The sink and drains in the H-70 facility will conduct any spilled liquid to a drain tank containing bleach to neutralize the hydrazine. The contents of the drain tank, a dilute, aqueous solution of bleach and the salts formed by neutralization, will be disposed of in the sanitary sewer.

Spills and Impacts of Hydrazine. Response plans for spills of this material are being prepared by the Montana Air National Guard and will be sent to the State of Montana for coordination.

Potential impacts from hydrazine are addressed in preparations for carrying out normal operations and also for mitigating accidents, such as ignition or spills. The potential impacts of normal operation would involve technicians rather than the environment. Permissible exposure limits and recommended procedures and equipment for complying with them are given in AFOSH Standard 161-13. In normal operations on the flight line, the equipment and procedures used in changing tanks on aircraft would negate the inhalation hazard to pilots and technicians. In normal operations in the hydrazine facility, impacts will be minimized by forced-air ventilation, protective clothing, air packs, and a closed system in which tank refilling is carried out above a sink in which drippings are caught and neutralized. Concentrations of hydrazine in air will be monitored in indoor areas, hangars and the hydrazine facility, as necessary.

Accidental ignition of hydrazine will be presented by electrical grounding of equipment and by storing the liquid in steel containers.

In preparations for mitigating the consequences of accidental spills, potential impacts on technicians, air quality, and groundwater, are addressed. For technicians, such impacts as eye irritation and toxic effects resulting from skin absorption and inhalation will be prevented by rubber gloves, protective clothing, and face shields. Safety showers and eye wash fountains will also be available as first aid.

Because local concentrations of hydrazine in air from accidental spills could exceed guidelines, a spill-response team of trained personnel will be prepared to neutralize spilled H-70 quickly. The team would carry out spill countermeasures developed by the Air Force, described in T.O.1F-16A-2-49GS-00-1, and adapted for use at the Montana Air National Guard base as described in the Hazardous Materials Management Plan being developed for this base. Equipment available to the team will include protective clothing, air packs, neutralization chemicals, and equipment for retrieval and containment of spilled liquids. The procedures for treating spills of H-70 will involve surrounding the spill with an absorbent dam of rags, neutralizing with bleach, and diluting with water. The diluted liquid would then be mopped up and put into containers to be removed later by the Defense Reutilization and Marketing Office. Household bleach would be used to neutralize any hydrazine remaining on the pavement; any excess chlorine from the bleach could be destroyed, if necessary, by sodium thiosulfate solution. Montana State regulations on treatment of hazardous wastes would be observed in management of spilled hydrazine.

Potential effects on groundwater and air quality from hydrazine usage at the Montana Air National Guard Base would be small. If technicians are safe at a distance of 50 ft from any outdoor spill at an air base, as indicated by Air Force engineering calculations, it follows that effects on air quality of a larger area would be negligible. Application of the spill response procedures described above should negate any impacts of hydrazine spills on groundwater.

Thus, control of the potential impacts from both normal operations and accidents involving hydrazine would be based on procedures and equipment specified in Air Force regulations and also on state regulations for handling of hazardous wastes. The effective use of these procedures and equipment will be based on training of personnel in specific assignments for normal operations and accidental situations.

Operations with hydrazine carried out in accord with these plans should result in insignificant impacts on base personnel and on the air quality and groundwater for the base and surrounding communities.

4.1.5 Archeological/Historical Resources

It will be necessary to consult with the State Historic Preservation Office prior to land acquisition/alteration (Stanfill, 1985). Also, if any prehistoric remains are encountered during construction, it would be necessary to immediately notify the State Historic Preservation Office.

4.1.6 Land and Soil Quality

None of the proposed activities associated with the conversion should significantly affect the soil quality in or around Great Falls International Airport. Most of the building construction and modification will occur in areas on the base that have already been extensively altered by past construction activities. The one exception is the potential location for a new missile storage/maintenance facility located between runways 03-21 and 16-34. Approximately 167-208 acres of land will be required for the facility and the ordinance safety area. While immediate construction impacts will be negligible, the area around this facility will be opened for new base development because of utility development to support the munitions storage facility (Peat Marwick, 1985). This area is presently in mowed grassland.

4.1.7 Herbicides and Pesticides

The F-16 conversion would require no change in the rates of herbicide and pesticide application and the procedures used.

4.1.8 Socioeconomic Factors

The socioeconomic impacts related to the conversion could possibly occur in the area of employment. As Table 2.1 indicates, staffing requirements for support of the conversion could mean the loss of up to 68 positions. The effect of this staffing requirement on the area economy would be dependent on the magnitude of the change. Moderate loss of employment could be tempered by the need for construction workers. Positive short-term secondary economic benefits could occur as the result of the purchase of building materials in the area for the construction program. Because the deviations in employment are small, no significant adverse socioeconomic impacts are expected as a result of the conversion.

4.1.9 Air and Land Traffic

The conversion action would not change either air or land traffic operations. Military air operations would remain identical (at about 48 daily operations) once the F-106s are removed and F-16s take their place. There is only a one-month transition period (expected to be June 1987) in which more sorties are anticipated as the pilots train to become proficient in the operation of the F-16s.

Concerning land traffic, the conversion will maintain the same number of vehicle equivalents. No change in the frequency of use of those vehicles is anticipated. Because of the personnel reduction resulting from the conversion, however, less personnel traffic is anticipated. During the construction period, that reduction in personnel traffic will be offset by construction-related traffic.

4.1.10 Natural Resources

Since construction activities associated with the conversion would affect less than 1% of the airport area, there would be very little impact on the ecological resources of the base of airport. In addition, these activities would be occurring in an urbanized location already significantly altered from the former natural state.

4.1.11 Endangered and Threatened Species

While bald eagles and Peregrine falcons have been sighted on airport property, these sightings were of birds passing through the area because suitable feeding and nesting areas do not exist on or near airport property (U.S. Army Engineer District 1979). With reduced noise levels of the F-16 compared to the F-106, the vertebrate populations on or near the ANG base will experience lower levels of noise disturbance if the proposed action is implemented.

4.1.12 Land Use

The land use impacts to the area surrounding the airport are related to noise and are discussed in Sec. 4.1.2 under "Frequency of Flight Operations." The primary land use impacts have to do with land requirements for various facilities related to the conversion. The only facility of any size likely to impact land use at the airport is the missile maintenance and storage and alert facility. It is estimated that this facility, with a 1250-ft-radius ordinance safety zone, will require 167-185 acres (Peat Marwick, 1985). The Montana air National Guard estimates land requirements to total 208 acres for the missile facility. Of the 208 acres, 188 acres would be for buffer zone around the facility (Shick, 1986). The only available site for this facility would be between Runway 03-21 and 16-34, north of Runway 07-25 (Peat Marwick, 1985). This area is indicated in Fig. 4.3. The land would have to be leased from the airport authority, and its use would mean no alternate uses could be made of that area. Aside from the land requirement for the missile facility, all other construction projects would take place on the 125 acres currently leased. No significant adverse land-use impacts are expected off the airport site.

4.1.13 Low-Level Flying Routes

No change is expected in the use of low-level flying routes as a result of the proposed action. There would, however, be less noise and fewer air pollutants emitted.

4.2 RELATIONSHIP OF PROPOSED ACTION AND OBJECTIVES OF LAND USE PLANS, POLICIES, AND CONTROLS

The Great Falls Area Comprehensive Plan (1981, pp. III-1 - III-10) lists a number of goals for the growth policy of the area. The goals relevant to the proposed action are (to):

> Encourage "industrial growth to provide steady, nonseasonal employment which will stimulate stable commercial development."
>
> "Enhance the urban environment."

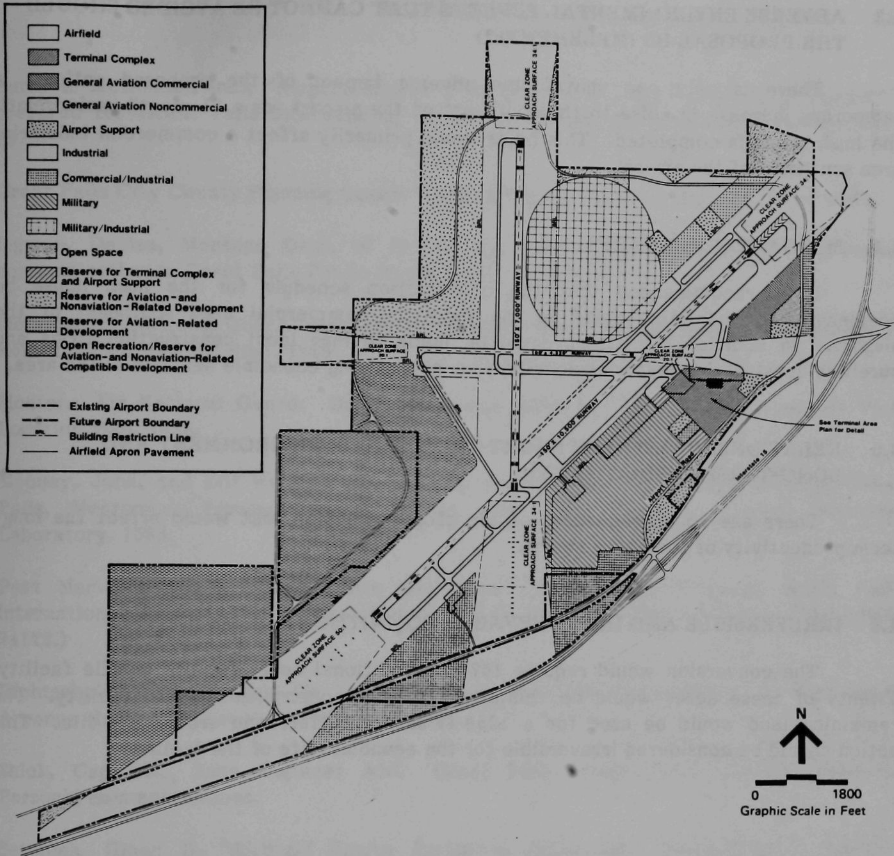

FIGURE 4.3 Projected Land Use Plan for Great Falls International Airport (Source: Peat Marwick, 1985)

Also listed as a short-range objective for the airport in the comprehensive plan is (to):

> "Establish new facilities to house federal agencies at the airport" (1981:VIII-3).

The proposed action is not in conflict with the existing comprehensive plan or the airport master plan (Peat Marwick, 1985). The construction of the missile facility would require lease of an additional 167-208 acres from the Great Falls International Airport Authority. Arrangements for leasing this land have not been made to date, but no negative impacts are anticipated.

4.3 ADVERSE ENVIRONMENTAL EFFECTS THAT CANNOT BE AVOIDED SHOULD THE PROPOSAL BE IMPLEMENTED

There is only one unavoidable adverse impact of the proposed action: a temporary increase in noise to the southeast of the airport for a 21-month period, until the hush house is completed. This noise would primarily affect a commercial industrial area southeast of the airport.

4.4 MITIGATION MEASURES

It is recommended that the construction schedule for the hush house be accelerated to minimize noise to the industrial/commercial area southeast of the airport. In addition, an effort could be made to hire local construction firms and purchase construction materials locally, thus maximizing economic benefits to the area.

4.5 RELATIONSHIP BETWEEN SHORT-TERM USE OF ENVIRONMENT AND LONG-TERM PRODUCTIVITY

There are no consequences of the proposed action that would effect the long-term productivity of the environment.

4.6 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The conversion would require 167-208 additional acres for the missile facility. Twenty of these acres would be committed for the construction of the facility. The remaining land would be used for a 1250-ft safety buffer zone around the site. This action should be considered irreversible for the economic life of the facility.

REFERENCES

Burns & McDonnell Inc., "Airport Master Plan for Great Falls International Airport," prepared for Great Falls International Airport Authority, Great Falls Montana. July 1979.

Great Falls City County Planning Board, "Great Falls Area Comprehensive Plan." 1981.

Ingman, Denise, Montana Dept. of Health and Environmental Sciences. Personnel communication to Great Falls Public Works Dept.. July 29, 1985.

Montana Air National Guard. Montana Air National Guard Oil and Hazardous Substances Pollution Contingency Plan. 1985.

Montana Air National Guard. Oil & Hazardous Substance Pollution Contingency Plan Location Map. 1986.

Mooney, John, and Bill Walters, City-County Planning Office, Cascade County, Great Falls, Montana. Personal communication with Gary Williams, Argonne National Laboratory. 1986.

Peat Marwick, Master Plan Update and Noise Compatibility Program, Great Falls International Airport. 1985. (Peat Marwick, P.O. Box 8007, San Francisco, California, 94128.)

Richtscheid, Voyd, Montana Air National Guard. Personal communication to R.H. Pearl, Argonne National Laboratory. May 20, 1986.

Shick, Capt. G., Base Engineer ANG, Great Falls International Airport, Montana. Personal communications.

Seitchek, Glenn D. "Aircraft Engine Emissions Estimator," Engineering & Services Laboratory, Air Force Engineering & Services Center, Tyndall Air Force Base, Florida, Report ESL-TR-85-14. Nov. 1985.

Speakman, J.D., R.G. Powell, and R.A. Lee, 1978a. "Community Noise Exposure Resulting from Aircraft Operations: Volume 4. Acoustic Data on Air Force Trainer/Fighter Aircraft," Aerospace Medical Research Laboratory Report Number AMRL-TR-731-110(4), Wright Patterson Air Force Base, Ohio, February.

Speakman, J.D., R.G. Powell, and R.A. Lee, 1978b. "Community Noise Exposure Resulting from Aircraft Operations: Volume 3. Acoustic Data on Military Aircraft: Air Force Attach/Fighter Aircraft," Aerospace Medical Research Laboratory Report Number AMRL-TR-731-110(3), Wright Patterson Air Force Base, Ohio. February.

Stanfill, Alan L., Deputy State Historic Preservation Officer, State Historic Preservation Office. Personal communication to M.J. Atwood, Airport Director, Great Falls International Airport. Nov. 27, 1985.

U.S. Army Engineer District. Final Supplemental Environmental Statement, Sun River Flood Protection Project, Great Falls, Montana. 1979.

U.S. Bureau of Economic Analysis. "Employment by Type and Broad Industrial Sources," Regional Economic Information System. April 1984.

U.S. Bureau of the Census, 1983a. City and County Data Book. 10th ed.

U.S. Bureau of the Census, 1983b. Current Population Report: Population Estimates and Projection Series P-25 No. 937. Provisional Projections of the Populations of State by Age and Sex. August.

U.S. Bureau of the Census, 1984. Population Estimate Series for States, Counties and Incorporated Places, Computer Generated List.

U.S. Bureau of the Census, 1985. Computer Generated List of Population Estimates. July 1.

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